Thank you for your comment, Alan Burnham, PhD.

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Comments on the Draft PEIS on Oil Shale and Tar Sands

#1. The introductory letter states that the BLM has decided to take a fresh look at land use in the 2008 PEIS to reassess the appropriate mix of allowable uses with respect to oil shale and tar sands. On page 1-4, it is stated that the PEIS is a result of the settlement of a lawsuit. On what basis did the Department of the Interior decide such a settlement was in the best interest of the United States instead of taking the case to court? Was such a settlement merely a convenient excuse to change the PEIS for political purposes unrelated to any technical basis? What documents exist in the Department of the Interior that provide the basis for accepting this settlement? Since having land potentially available for leasing does not mean that the land must or will be leased, and since any activity will have to address any pertinent environmental issue currently identified or identified in the future, the relatively trivial new information that has come to light since 2008 is not a viable excuse for the massive change in the commercial leasing program. Is the Department of the Interior aware that there have been no directives from Congress to change that time period or reopen the PEIS process, and indeed there have been actions to the contrary, so that the Department of Interior is in violation of the spirit if not the letter of 2005 Energy Act?

#2. An EIS is supposed to create the document facts and analyses that will enable an informed decision. The current document does not satisfy all the required NEPA criteria. Consequently, we think any decision based on this EIS is flawed.

The only alternatives studied are various levels of leasing. The alternative of having no commercial leasing program is not considered. The adverse effects of not doing anything can include stunted economic growth due to a high balance-of-payments deficit, the need for a large military force to assure a safe source of petroleum, and periodic wars to enforce that security. Alternatively, it could compare shale oil to biofuels in terms of cost and water use. Or it could compare shale oil to the impacts of gasoline rationing. There are negative impacts to not developing oil shale. So the PEIS is not adequate to compare both the benefits of oil shale and the negative impacts of alternative.

The preferred alternative 2b purports to provide a leasing program in Colorado, but the conditions are so onerous that it might effectively be considered a ban of commercial leasing in Colorado. Much of the land is on parcels too small or too gerrymandered to attract commercial interest. Industry comments about what would be needed have been ignored completely, so this alternative is effectively a no-leasing option, and therefore the implications of no one responding should be analyzed (see previous paragraph). The fact that best resource, in the center of the Piceance basin, is almost absent from the leasing plan is neither rational nor in conformity with the required cost-benefit analysis.

The EIS discusses possible adverse effects of oil shale development on low income people but does not acknowledge the obvious and powerful advantages of oil shale development for low income people including job opportunities and a better standard of living. There are numerous statements about possible negative effects of oil shale development but essentially no discussion of the benefits. Consequently, the EIS fails to provide the information needed for an informed choice.

In the end, oil shale development, like many of the choices in life, is all about tradeoffs. Agriculture is the biggest user of water and destroyer of natural habitat, and it creates a bigger dead zone every year in the Gulf of Mexico than the Macondo blowout. But we all like to eat, so agriculture exists. This PEIS describes virtually every negative environmental impact imaginable, but it does not discuss the potential economic and environmental benefits. So there can be no rationale balancing of benefits and interests as required by the NEPA.

Most egregiously, the PEIS does not acknowledge that the center of the Piceance Basin contains oil shale so rich in energy that the amount of energy produced per the amount of land disturbance per would rank it near the top of all energy sources. Nevertheless, this land has been all but taken out of the leasing program. Nor does it acknowledge that in any oil shale activity, the possibility exists to reconstruct the land in any desired manner to optimize habitat for desired species.

#3. Page ES-1 states that the BLM intends to take a hard look at whether it is appropriate for approximately 2,000,000 acres to remain available for potential development of oil shale. Why does this refer to the future? One could posit that the BLM made a decision on which alternative to pick without taking a hard look—facts are not important if the decision maker has a prejudicial commitment to a specific outcome.

#4. Page ES-9 states that the BLM looks forward to gaining a clearer understanding of the implications of developing oil shale. For water quality and quantity, for example, industry has provided much information on updated estimates of water needs for oil shale, and that information is used in Section 4. What else is needed? There are a variety of laws in existence that protect water quality, and any lessee would have to go through a NEPA process to demonstrate that their proposed activities will not violate existing laws and regulations. Further, if there is a compelling public need to limit water consumption by an oil shale company or industry to less than industry currently estimates, no further information is needed from industry—industry would simply be required to stay within that bound. That said, does the BLM have the position that water rights are not true property rights and can be revoked for political purposes? All industry analyses indicate that enough water rights are in place to support oil shale production in excess of 1 million barrels per day. Or if the issue is CO_2 emissions, they are outside the proper consideration of the PEIS as stated on pages 1-13 and 2-78, and the BLM does not have the authority to generate regulations of such not authorized by Congress. Further, CO_2 mitigation is primarily a financial issue, not a technology issue, and it can be addressed straightforwardly if and when regulations are implemented, for example via sequestration or sale.

#5. On page 1-15, the PEIS lists governmental agencies that cooperated in the PEIS. What was their position on the amount of acreage that should be available for development, and is the PEIS consistent with the desires of the local governments?

#6. On page 1-17, the footnotes say that EGL has been renamed "since the preparation of this PEIS". To what PEIS does "this" refer? EGL was renamed AMSO in early 2008, well before the start of the current draft PEIS. OSEC was changed to Enefit in 2011 prior to the issuance of the current draft PEIS.

#7. On page 2-13, on what basis did the BLM decide that commercial viability requires 25 ft of oil shale >25 gal/ton in Utah and Colorado but only 15 ft of 15 gal/ton in Wyoming? Economically recoverable depends on both depth and technology in a complicated way. The oil shale industry is in a much better position to decide what resource it can recover economically and where it will risk its capital. The BLM has is not in a position to make a similar calculations.

And just because an area is open for commercial lease applications does not mean that any company will actually try to lease it if it does not see commercial viability. Concerns about land speculation are more appropriately addressed by performance clauses in the lease rather than taking them off the potentially leasable area.

#8. There are technically incorrect statements about oil shale on page 2-15. Not all oil shale in the Green River formation is a marlstone. The Garden Gulch member is clay rich and does not fall within the marlstone field. The temperature required to generate shale oil varies with time. For timescales of human activity, temperature for significant shale oil generation is as low as 500 ^{o}F, as that temperature for a few years will convert a substantial amount of kerogen. The processes being pursued by Shell and by AMSO will generate shale oil at temperatures primarily between 600 and 700 ^{o}F. While some people have recently misused the term "shale oil" to denote shale-hosted natural crude oil, the term "shale oil" has meant the product formed from destructive distillation of oil shale for hundreds of years.

#9. On page 2-30, the statement is made that six existing RD&D leases have terms that could allow commercial development on up to 5120 acres each. The most obvious interpretation of this statement is that even though the option 2 acreage largely excludes the preference right lease area from commercial leasing (see, for example, Table 2.3.2-2), it would be allowed for commercial leasing to the RD&D lease holder by virtue of an existing contract, and this interpretation is supported by words on page 2-54. However, if it is suitable for commercial leasing, it should be included in the area available for commercial leasing.

#10. On page 2-26, the statement is made that if an RD&D lease holder relinquishes its lease, the area may be leased to another operator with the decisions in the RMP at the time of application. Which application? The original RD&D lease application or a subsequent application after the original lease is terminated? Does that mean that if Alternative 2b is adopted, essentially all of that acreage would be removed from commercial leasing? What would occur if the lease is transferred to another entity rather than terminated? Would the new entity be required to pursue the same process originally proposed, or could the entity modify the process consistent with the old or a new environmental assessment?

#11. The statement is made that MMTA would be excluded from oil shale leasing until technology or other factors exist to develop oil shale without jeopardizing trona mines. Does that mean that if a company demonstrates that it is possible, the land would be available for leasing? If so, a lease stipulation would be a more appropriate way to enforce that requirement. Multi-mineral extraction requirements are already in force for nahcolite and oil shale.

#12. The first paragraph mentions geologically prospective areas not being excluded for any specific could be considered at a later time. Which areas are those, specifically, and for what reason did the Department of Interior not consider them at this time? This appears to be a violation of the intent of Congress in the 2005 Energy Act. The subsequent discussion on that page appears to describe the intent of the Department of the Interior to frustrate rather than facilitate oil shale development for the good of the American people, in direct violation of both the 2005 Energy Act and the Department's own charter.

#13. It is stated on page 2-35, in effect, that Alternative 2b was not conceived until the PEIS was in draft form and is not even properly discussed in the rest of the document. An obvious question, therefore, is what specific technical discoveries of the PEIS process motivated the creation of this alternative and its eventual adoption? If no technical discoveries were the cause, what specific meetings or actions precipitated the idea after the analysis of alternatives had been completed? It appears that the alternative was motivated by political forces completely separate from legitimate PEIS considerations and therefore with the spirit of the 2005 Energy Act.

#14. Figure 2.3.3-1 on page 2-37 demonstrates that the preferred alternative directly contradicts the BLM's stated rationale for the PEIS and leaves no doubt that this alternative was designed specifically to prevent commercial development of oil shale in Colorado in direct violation of the 2005 Energy Act.

Almost the entire Piceance Basin is excluded from commercial leasing applications even though it has not been identified as either Sage-Grouse Core or Priority Habitat or Lands with Wilderness Characteristics. Absurdly, part of the land proposed for commercial leasing applications is identified as Sage-Grouse critical! Finally, most of the land made available is in such small, isolated parcels that it would effectively prevent significant commercial development.

#15. As much Figure 2.3.3-1 is a farce, Alternative 4 shows a lack of thought concerning the definition of "moderate" in moderate development. Land proposed for commercial leasing includes Sage-Grouse critical habitat. Even though it is arguable that oil shale development could occur without adversely affecting the Sage Grouse and there is a paragraph outlining the responsibility of the field office in that regard, the amount of acreage so designated is so small that it could easily be eliminated without significant impact on the oil shale industry this century. The PEIS itself says the probability of leasing is low, so why not just take it off the table and save a lot of wasted effort? Similarly, there is a portion of the Cathedral Bluffs designated as Lands With Wilderness Characteristics that could easily be eliminated from leases without adversely affecting the oil shale industry.

#16. In discussing a comment about limiting leases to those in process, the PEIS states that it is not consistent with the Secretary's and Director's emphasis on developing and maintaining a robust RD&D process. The preferred alternative has so little land available in such isolated parcels that it is not conducive to either R&D or commercial activity. The clearest evidence for this is that the number of proposals dropped from 20 to 3 when the preference right lease area was dropped from 5120 to 640 acres. While it may be profitable to perform multi-mineral extraction on a 640 lease tract, oil shale production alone is probably not feasible on such a small plot given the 500-ft restriction of activity from the border of the lease, which potentially reduces the available resource by one third. Further it is clear that a significant portion of the land made available will not even support a 640-acre lease. There is no rational justification for dividing the available acreage into tiny tracts other than to block commercial development without overtly abrogating existing RD&D lease contracts.

#17. The statement is made that "Despite the absence of a commercially viable processing technology" is not intrinsically correct. Commercially viable depends on the market price for oil, so this statement presupposes some market price for crude oil. The assumptions circa 1980 were that the price would be $90/bbl by 1990 and increasing thereafter. If that price prediction was correct, the processes at the time would have been commercially viable, and the statement here would be demonstrated to be false. In fact, the price of crude oil dropped dramatically in the early 1980s and fell to historic lows in the 1990s (<20/bbl), so the failure of oil shale to take off was simply due to a glut of inexpensive conventional crude oil, driven by discoveries and production in Alaska and the North Sea, among others, and not a failure of the technology of the time. In fact, the process being proposed by Enefit today is very similar to that pursued by Chevron and ExxonMobil. Of course, automation has improved in the past 30 years, so the process now will take fewer people to operate, but it is basically the same. And the reason that it is commercially viable now is that the oil price is at the $100+ dollar per barrel range considered in economic analyses of the late 1970s. So the correct statement would be "Under the incorrect assumption of $90-$100/bbl oil late in the 20th century,"

#18. The statement of adverse impact of the oil shale bust in the early 1980s is correct, but reading it in the absence of other economic history would suggest it is unique in the history of the United States. It is not. Speculative house building in many locations around the country based on the assumption of continued price escalation and economic growth has resulted in the foreclosure of millions of homes as a result of the real estate bust of 2008. This is just one of hundreds of stories of boom and bust that are characteristic of economic development across industries. While prudent action can and should be taken to minimize the probability, no human endeavor is without risk, and the oil shale industry should not be paralyzed due to a lack of 100% certainty in the economic and energy predictions for the next century. If this tack were taken for all proposed economic activity, all investment would cease. In fact, most proposed oil shale growth would occur at a measured pace using fewer workers per unit of production. Establishing a sound and gradually growing industry in the absence of national energy panic is the best way to avoid the catastrophes of the past.

#19. The discussion on pages 3-241 through 244 is incongruous. Statements are made about rapid growth and employment due to the oil and gas industry and having to import skilled labor from afar, and statements are made that wages are increasing due to the oil and gas industry as if

that is a bad thing. Now, the unemployment rates are about 10% in regions that would be affected by oil shale development, and foreclosures are common. Since it is doubtful that natural gas activities will reach the levels of 4 years ago in the coming decades due to established infrastructure and low natural gas prices, what is going to pull the economy of western Colorado out of its malaise?

#20. On pages 3.11.2.2.4, the PEIS states that rental housing in the Rifle area is all taken and there are no hotels available. That may have been true 3 years ago, but it is not true now. Rental housing is easy to find, and rents are dropping. Hotel rooms are plentiful, and construction of one hotel was stopped a few years ago because of the drop in demand. Foreclosures on houses are common, just like other parts of the country. There are several partially built apartment units in foreclosure. If the PEIS is supposed to give a basis for economic status on which to make decisions about oil shale, it must be up to date. Otherwise, it is giving a completely mistaken view of why economic development, including oil shale, is needed to maintain a healthy economy in the Rifle area in the long run. In other words, if it was worth redoing the PEIS, it is worth doing it right and not using data that is 3 years old as if it were current. Again, the way to avoid booms and bust is to have steady growth, and waiting to develop oil shale during a national crisis is exactly opposite to what the country should do. It should have leasing policy that enables enough high-quality resource to be available for leasing so that the industry can learn, mature, and grow gradually over the next 20-30 years. Alternative 2b, on the other hand, will prevent commercial oil shale development entirely, except possibly for a few small operations.

#21. The statement on page 4-6 that spent shale volume would increase by 30% over the volume of raw shale introduced into the retort is incorrect. The 30% increase in volume occurs during mining, and the volume of shale is basically unchanged during the retorting process. It would be correct if the statement were that the spent shale volume increases by 30% over its volume in the earth before mining. The same is true of the overburden for surface mining operations.

#22. On page 4-13, the BLM has projected that the new electricity capacity needed for in-situ oil shale would be generated by coal as a worst case. That may be true if the electricity is generated in Utah and transmitted to Colorado, and of course, that changes the Colorado impact. If the electricity is generated nearer, it will probably be generated from a combination of co-produced gases and natural gas. This is an active choice that could be made to minimize impacts, and the PEIS ignores that possibility. In fact, no company is currently considering using coal-generated electricity as its preferred power source for major operations. The PEIS acknowledges that some proposed in-situ processes do not plan to use electrical heaters, but it does not reflect this in its subsequent analysis. It seems that it the PEIS would be better served by making a range of estimates of water usage, because the fact that this is a worst case will get lost in public discussions.

#23. Section 4.5.1.2 grossly over-estimates water needs. Enefit claims lower water usage than 2.6-4.0 bbl water per bbl oil—their web site says 1-3 tonne per tonne of shale oil. Also, the correct range for in-situ projects is zero to 3 bbls water/bbl of oil. Zero might come from working out of the aquifers (Garden Gulch member) and using the cleaned-up co-produced water for cooling needs. Also not mentioned is the possibility of using reverse osmosis or distillation of deep brackish water to supply the water needs for oil shale production. The economics appear

tolerable, particularly if waste heat is used for a distillation method, but this has not been actively studied because of the availability of plentiful water at low cost—ironic due to the near hysteria about water availability. The point here is that shale oil production is such a high-value operation and its water needs sufficiently modest that it probably could get along with no significant draw on fresh-water supplies if the government insists upon confiscating current water rights—estimates are that more than a million barrels of oil per day could be produced with existing water rights.

#24. It is likely that a 100,000 bbl/day oil shale industry would use less than 1% of the upper Colorado Basin remaining available surface water. Tables 4.5.2-1 and 3.4.1-2 indicate a water surplus of about 300,000 ac-ft/yr, and a generous estimate of water consumption by an in-situ industry would be only 10,000 ac-ft/yr according to Table 4.5.2-1 if it did not use electrical heating. So why is the Department of Interior ignoring this in their analysis of water use vs. water availability?

#25. On page 4-54, the PEIS employs the phrases "at best, professional judgment" and "at worst would be speculation." The PEIS should not be using speculative numbers from non-experts in its consideration. There are numerous good professional judgment numbers in the literature that agree reasonably well that one does not have to use the derogatory qualifier "at best". The point here is that there will be a range of emission estimates for various candidate technologies, and establishment of regulations on CO_2 emissions would affect the ultimate outcome. If the public has a compelling interest to establish a performance standard, and then it will be industry's responsibility to figure out how to meet it. We don't need national policy based on the "bring me another rock until I see one I like" principle.

#26. Figures 4.9.1-1 and 4.9.1-2 show pictures of a UMATAC industrial process. No one in the United States is considering using this technology, so why show pictures of it? It would seem more reasonable to show pictures from the new Enefit plants in Estonia and even a Petrosix plant in Brazil, as the latter is similar to the Paraho process favored by several US companies.

#27. Nowhere in the vicinity of page 4-154 did I see a discussion of the fact that the oil shale activities in the 1980s generated a substantial experience on how to reclaim surface disturbance. It would seem to an uneducated reader that everything for the oil shale industry would have to be learned from scratch. In fact, photos of reclaimed areas would add more to the intelligent discussion of this issue than much of what is in the PEIS.

#28. In the introductory sentence of 4.12.1.4, it is stated that "it is likely that oil shale technologies will require large amounts of water." Compared to what? Has the BLM compared it to biofuels? In the arid west, typically 85-90% of the water is used for agriculture, and an oil shale industry will have only a minor effect on that number. So from one perspective, nothing but agriculture uses large quantities of water. Now if one uses a metric of economic value generated per unit of water consumption, how does oil shale compare to other industries. The Department of Interior should not repeat common misstatements about water crippling agriculture—it should undertake an honest in-depth analysis, using the technologies currently being contemplated and not those last used in the 1970's. This is likely to lead to a conclusion

that a significant oil shale industry would divert only a few percent of agricultural water, and that could easily be made up by more efficient use of water by agriculture.

#29. The implicit attitude of section 4.13.1.3 is that the best thing we can do for poor people is to leave them alone so they can continue to be poor. Grand Junction and Carbondale are so far away from the oil shale development that any direct impact is clearly a stretch. An equivalent statement is that the skiing industry is hurting the poor people in Carbondale because skiing is a rich-person's hobby and drives up real estate values, and therefore we should kill the ski industry. Instead, the oil shale industry will provide high-quality jobs and economic growth that will create many opportunities for people to escape poverty. The biggest threat to the health and well-being of poor people is an economy that cannot provide decent employment opportunities for all. A robust oil shale industry can help sustain long term economic growth in western Colorado. Early indications from ongoing RD&D activities fully support this conclusion.

#30. It appears that the writer of this section was unaware of what all was discussed about oil shale and retorting in the preceding hundreds of pages. I recommend that the first two sentences be stricken as redundant and useless.

#31. The bottom paragraph on page 6-1 states that making land available for lease applications has no impact on environmental or socioeconomic setting. It is the subsequent development work on the land that would have an impact, and it must be analyzed by the NEPA process. So what is the justification for removing essentially all the land in Colorado from the lease application process? It has been stated by many people many times that having land available for leases does not mean that it will be leased. If oil shale's detractors are correct, few or no leases will ever be pursued because oil shale is fool's gold and won't ever be developed. The real truth was stated by Utah Senator Bennett, "What are you afraid of?...You are afraid it might work." If the concern is merely companies tying up land on a speculation basis, as is sometimes said, that could easily be prevented by lease performance terms.

#32. The information about AMSO LLC in section A.5.3.2 is extremely outdated. An Addendum to the original Plan of Operations was submitted in July 2008 and approved by the BLM in October 2008, and a Plan of Operations was submitted in May 2009 and approved by the BLM in September 2009. The stated reason for the update of the PEIS is to incorporate more recent information, and here is a case where the BLM has not incorporated relevant information contained within its own regulatory approval process.